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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification 5 :</b> <b>G06F 15/02</b>		<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 91/11769</b> <b>(43) International Publication Date:</b> <b>8 August 1991 (08.08.91)</b>
<p><b>(21) International Application Number:</b> <b>PCT/CA91/00018</b></p> <p><b>(22) International Filing Date:</b> <b>23 January 1991 (23.01.91)</b></p> <p><b>(30) Priority data:</b> 008,300 23 January 1990 (23.01.90) CA</p> <p><b>(71)(72) Applicant and Inventor:</b> WOODILL, Kim, Robert [CA/CA]; 4 Tyrrell Place, Nedean, Ontario K2H 9C2 (CA).</p> <p><b>(81) Designated States:</b> AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, DK (European patent), ES, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), GR (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, PL, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent).</p>			
<p><b>(54) Title:</b> <b>PORTABLE ELECTRONIC READING AND REFERENCE DEVICE</b></p> <p><b>(57) Abstract</b></p> <p>A portable device for the electronic display of reading and reference material to allow for an alternative to books and other paper based presentation formats. Provides the capability to access and retrieve text, data and graphics from previously encoded units of computer addressable storage media, and transmit these data to an integrated monochrome or colour video screen. The data will reside on small pre-prepared units of high volume data storage media (e.g. 3 1/2 inch computer diskettes), which are individually loaded into the device as required. User controlled functions allow predefined groups of data, i.e. pages, to be accessed and displayed sequentially forward or reverse, by page number, or by the specific page which was last displayed on individual data storage units through an electronic placemark function. Display functions include a capability to increase the size of the data characters on the viewscreen, to allow the device to be used by the visually impaired, and controls for adjustment of the visibility attributes (e.g. resolution, contrast, colour, tint, etc.). Protection and support is provided by a combination cover and adjustable stand. The device also incorporates a carrying handle to enhance portability. This invention is distinguished from and improves upon desktop or larger computers by: read only, non-programmable and non-programming functionality; simplicity of controls and operation; and portability. It is distinguished from and improves upon portable computers by: read only, non-programmable and non-programming functionality; simplicity of controls and operation; and lower cost. This invention is distinguished from and improves upon print and paper, or other non-electronic text and data output methods by: providing the capability of access to data residing on storage media which has far less volume and weight per unit of data; durability; text and data size adjustment capability; internal illumination; user convenience; and potential for the reduction of environmentally hazardous pulp and paper requirements.</p>			

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- 1 -

PORABLE ELECTRONIC READING AND REFERENCE DEVICE

Field of Invention

This invention relates to a portable, electronic device to be used to display text, data and graphics for reading or resource referral. The word "page" herein equates to a screen display of text, a screen display of numerical data, a screen display of graphical data, or a combination of these. Utilizing available technology the hand-held or free-standing viewer will basically provide the function of a book, by displaying individual pages on an integrated video screen. The pages will reside on units of computer addressable data storage media (including but not limited to magnetic disc media) which can be inserted into the device. Simple and minimal controls will allow the use of forward and reverse page access, page locate, placemark locate, image size adjustment and screen visibility adjustment functions.

Background of Invention

The activity of reading or referencing text and data has historically been accomplished through the use of print on paper format, books being the most obvious example. Recently this data is also becoming more widely available through the use of computer addressable storage media (e.g. computer diskettes) which allow the display of the data on a video screen, or are used to create paper format documentation. Both these methods have inefficiencies and drawbacks which can be extensively alleviated by this invention.

The drawbacks presented by the use of portable or non-portable computers for the simple function of reading or referencing data, and the characteristics which this invention embodies to overcome or alleviate them are as follows:

**SUBSTITUTE SHEET**

- 2 -

Non-portable computers are bulky, heavy and typically require an external power source. This invention is portable and lightweight, and includes an integrated rechargeable power supply.

Computers are relatively expensive. This invention will be very inexpensive as compared to portable computers.

Computers are complex, to allow them to be programmable and programming devices. This invention incorporates controls which are minimal and simple to operate, with no programming or programmable requirements or functions.

The operation of computers requires the use of some method of data input, usually a keyboard, 'mouse' or light pen. The only user data input required with this invention will be the indication of a page or placemark search identifier via a keypad when required.

Due to input requirements computers lack some ergonomic features which are possible in a simpler device. The simple functionality of this invention allows the physical design to be done such that ergonomic features can be maximized.

The print and paper based format of data display has a number of serious disadvantages and negative attributes. These drawbacks and the characteristics which this invention embodies to overcome or alleviate them are as follows:

The reading and study of data on print and paper format is inconvenient for the user for the following reasons: pages or files must be searched for, located and accessed through physical means (i.e. page turning); most books and documentation require the use of two hands and/or support by an external prop (e.g. desk) while being used; printing inks and compounds sometimes transfer from the

**SUBSTITUTE SHEET**

- 3 -

paper to the user's hands; the use of print and paper based formats requires an external light source; text and data resolution and contrast cannot be changed. This invention is designed to be a more convenient method for reading and data review as a result of the following: the device allows page search and access to be accomplished electronically; the device provides the capability for one hand operation and an incorporated support for hands-free viewing; ink or other chemicals are not used; internal illumination allows use of the device with minimal or no requirement for external lighting; text and data visibility can be adjusted to the user's preference.

Print and paper based products are delicate, highly vulnerable to destruction, and relatively bulky, heavy and difficult to transport. This invention provides the capability to make use of data contained on units of computer addressable storage media (e.g. magnetic diskettes) which are durable, have a proven long operational lifetime, and are very small and lightweight relative to the volume of data that each can accommodate. The device is also small and lightweight, and includes an integrated carrying handle for ease of transport.

Print and paper documentation, particularly books, are relatively expensive for the consumer. The cost of computer addressable data storage units, with the data encoded, will be substantially less than that of print and paper documentation of the same data.

The pulp and paper industry is a major contributor to the depletion of forest resources and the increasing pollution of the environment. The use of data on computer addressable storage media will diminish the requirement for print and paper documentation, and the inherent environmentally destructive forestry and production

**SUBSTITUTE SHEET**

- 4 -

processes.

Most print and paper documentation is still disposed of through the normal waste removal process, with an inherently negative environmental impact. The process of recycling print and paper products also contributes to environmentally unattractive results such as de-inking by-products and energy consumption. Both the garbage and recycling methods also require huge, complex collection and delivery systems, using vehicles which burn fossil fuels, another polluting activity. The high data volume capabilities and reusability of computer addressable storage units will significantly reduce the disposal and recycling requirements for print and paper documentation.

The character size of data in print on paper documentation, with the exception of a limited number of large print books and documents, is too small for the visually impaired user to read without the use of inconvenient mechanical aids. This invention incorporates a character size enlargement capability, allowing the visually impaired to read any book or document produced for use with the device without additional assistance.

#### Summary of the Invention

Therefore this invention seeks to provide a portable, electronic reading and reference device comprising:

a functionality which excludes programming capabilities, and which does not allow the device itself to be programmed;

a monochrome or colour visual display of pre-defined groups of text, data and/or graphical characters;

a media drive mechanism to access pre-defined groups of text, data and/or graphical characters from a pre-encoded unit of data storage media which has been inserted into the drive;

**SUBSTITUTE SHEET**

- 5 -

an integrated circuit assembly incorporating the required microchips and integrated software;

control mechanisms which manage the functionality;

a capability of operation using standard electrical delivery or a rechargeable batteries system; and

a combination cover, support stand and carrying handle.

The invention consists of six main components. They are:

- a monochrome or colour video display screen which could use liquid crystal technology or other formats (i.e. gas plasma, CRT, etc.)
- an integrated circuit board including the required microchips and software programming;
- a media drive unit to access and retrieve the data;
- a rechargeable battery pack;
- eight control mechanisms including one ten digit numerical keypad;
- a combination cover/support stand/handle.

Each of these components is further described below.

#### Display Screen

The screen layout could be large enough to accommodate up to and including 30 lines by 80 columns, resulting in the potential of 2,400 characters of display, about the same as one page of a fine print book. The aspects of high resolution and image definition, wide angle viewing tolerance and effective internal lighting will be incorporated. The fact that there will be more characters per line than the average book means the need for eye movement from the end of one line to the beginning of the next will be

- 6 -

greatly reduced.

#### Integrated Circuit Board

A basic IC board containing the microchips, software and circuitry to enable the device to perform the required functions.

#### Media Drive Unit

The device used to retrieve data from the medium and transfer it for manipulation and relay to the screen. Media drive units (e.g. disc drive) are available in various types and storage unit capacities.

#### Rechargeable Battery Pack

A compact, lightweight rechargeable power source providing a minimum of six hours use between charges. Charge period will vary depending upon type of use, i.e. constant page flipping and searching as in studying or research, will result in a shorter time between charges than normal reading. Six hours under peak power demand is achievable.

#### Control Panel

Simple ergonomically placed controls provide access to all the device's functionality. Controls will be as follows: an on/off switch; a "Next Page" button; a "Previous Page" button; a "Find Page" button; a "Find Placemark" button; a 10 button numeric keypad to input page numbers for "Find Page" function; a data character size adjustment switch; and screen visibility adjustment controls.

#### Cover/Support Stand/Handle

An attractive combination cover, support stand and carrying handle, of durable, strong and lightweight material (e.g. high impact plastic). When closed, the front and top of the device, including the viewscreen, all controls and the media drive, will be protected.

**SUBSTITUTE SHEET**

- 7 -

Brief Explanation of Drawings

The invention is more particularly described in conjunction with the following drawings wherein:

Figure 1 is a view showing the front, top and right side of one embodiment illustrating components and controls;

Figure 2 is two views of the upper portion of the viewscreen in the Figure 1 embodiment, illustrating the information and data line functions in the normal and enlarged character mode;

Figure 3 is three right side views of the Figure 1 embodiment illustrating the components and functionality of the combination cover, support stand and handle; and

Figure 4 is a system block diagram of the Figure 1 embodiment.

Detailed Description of the Invention

The user first performs one of the following actions: turns on the device with the power switch (1) and inserts a data storage unit containing the required material in the media drive (2); or, turns on the device with a data storage unit already in the media drive; or, the power could be on and the user changes data storage units. Regardless, the device will automatically read the data storage unit with no further user interaction at this point. Each data storage unit will be produced so it will always automatically display a pre-defined first page on the viewscreen (3), which could be a title page, containing title, author, copyright data, publisher, etc. as required. The second page, accessed by the "Next Page" control (4), could display a Table of Contents and/or Index if required, (particularly essential for educational and research material). The Table of Contents or Index will indicate the page number where data is located, and by pressing the "Find

**SUBSTITUTE SHEET**

- 8 -

Page" control (5), the user activates the device to accept the numerical page identifier from the keypad (6). It then locates the requested page on the data storage media, and relays it to the viewscreen for display.

Normal reading (i.e. non-reference) with the device will be simple. The user presses the "Next Page" control (4) when finished a page, which prompts the device to locate and display the next sequential page. A "Previous Page" (7) function is also provided, which prompts the device to locate and display the previous sequential page, as reading often involves reviewing something a few paragraphs back. To access other than the next or previous page the "Find Page" (5) feature will be used.

Each page displayed will include an information line (9) at the top, in addition to the text/data area (10), on the view-screen. The dotted lines in Figure 1 represent where the data will appear, and will not be present on the screen. The vertical arrow down from the dotted lines indicates that the text/data area continues to the bottom of the viewscreen (3). The information line will display both "hard" and "soft" data (see Figure 2). Hard data (11) is defined as data that will always appear on each page displayed, i.e. page number, and perhaps title, author or other information, and will be on the left side of the information line. Soft data is the information that depends on use of the "Find Page" function, and will appear on the right. The soft data will consist of a message and input field (12) consisting of the following: "FIND PAGE NNNN", (the NNNN representing the capability to accept four numerical values input from the keypad), which will appear on the information line when the "Find Page" control is pressed; or the message "NO PAGE NNNN", which will appear if a page number higher than the actual number available on the

**SUBSTITUTE SHEET**

- 9 -

data storage unit is input. The text/data area (10), Figure 1, is where the actual text, data or graphics of the page being displayed will appear.

Pressing the "Find Page" control (5) prompts the device to accept the input of a numerical page identifier from the keypad (6). The "Find Page" search activity will happen automatically after the input field (12), Figure 2, is filled. This will require "zero-filling" of page numbers less than 1000; i.e. to find page 267, input 0267; for page 29 input 0029; while any 4 digit page numbers will satisfy the criteria. This allows the use of the "Find Page" function without the need for an additional control, and supports simplicity of operation.

A character size adjustment switch (13), Figure 1, will allow the user to increase the size of the data being viewed, to provide for use by the visually impaired (Figure 2B). For example, Figure 2A illustrates approximate text size at 2,400 characters per display while Figure 2B shows the same text at approximately 800 characters per display. In this case the character size adjustment switch will instruct the device to divide each defined page into three sequential sections. The data characters in each one-third page will be expanded and reorganized to fill the screen when that section is accessed. With this design the page number would apply to all three enlarged sections, and use of the 'Find Page' and 'Find Placemark' controls would access the first section of that page. The 'Next Page' and 'Previous Page' controls will access the next sequential section forward or reverse in this mode, regardless of whether the section had the same or a different page number. When the large character mode is in use Figure (2B) the information line at the top of the screen will display only an enlarged page number (11), leaving room for an enlarged

- 10 -

message and page number input area (12).

The final capability which the device will provide is a placemark function, (i.e. a method of 'remembering' a particular page the user wishes to access the next time the data storage unit is used). This is accomplished by having a tiny area of memory reserved as each data storage unit is produced. The device software will store the present page identifier in this area, updating it each time a new page is displayed. The 'Find Placemark' (8) control will instruct the device to read this identifier from the data storage unit and display that page. This method ensures the placemark is held even when the data storage unit is removed from the device. Display of the Title, Table of Contents and Index will not update the identifier stored in the placemark area on the data storage unit. This allows the user to access a data storage unit, see the Title, Table of Contents and Index if required, and then access the page last displayed from a previous session using the 'Find Placemark' function.

The device will include one or more 'Visibility' controls (14), which will allow modification of some or all of the display attributes of; resolution, definition, contrast, brightness, colour and tint of the background and/or data displayed.

The device will also have an automatic power down capability, i.e. if no controls have been used within a specified period, the device will shut off. Since the placemark is held on the data storage unit, the minimal inconvenience will be outweighed by the saving in recharge requirements.

The combination cover/support stand/handle (Figure 3) will function as follows: The cover/stand/handle (15) extends across the entire width of the device (16), and when closed as illustrated in 3A, the screen, controls and the

**SUBSTITUTE SHEET**

- 11 -

media drive are protected, and the handle (17) is in position for carrying. To use the cover/stand/handle as a support stand as illustrated in 3B, the user releases the clasps (18) on the top, opens and rotates the cover/stand/handle (counter clockwise in Figure 3 views) and folds it under the device by means of the two hinged joints (19, 20). The front hinged joint (19) allows the cover mechanism to fold, and the rear hinged joint (20) attaches it to the device. The hinged support brace (22) is then folded out from the back of the device and inserted into one of several slots (23) in the front of the cover. The angle the device sits at depends on the slot chosen.

The dotted line (24) in 3B and 3C represent the surface the device is sitting on. The rear hinged joint (20) will be spring loaded, which will cause the area between the hinged joints (21) to lie flat against the back of the device when the cover mechanism is open, as in 3B and 3C. To use the device without the support stand function the cover/stand/handle is folded completely under as in 3C. When the user has finished using the device the process is reversed and the clasps on the top engaged, thereby putting the handle in position for transport and the cover in place for protection as in 3A.

The invention is not restricted to the embodiment shown herein, and encompasses the following alternative possibility. The portable, electronic reading and reference device as described in this specification has a variety of potential application, design and functionality enhancements. Possible applications which the device would allow, other than those already specified are; the replacement of newspapers as they exist today with units of computer addressable storage media, portable unabridged encyclopedia and other large groups of documentation,

- 12 -

convenient recipe display, enhanced multiple text transport for students and greatly increased storage capabilities due to the size of the units of storage media as compared to books. The design of the device could allow such enhancements as a printer port for the creation of hardcopy if required, and the incorporation of water-proofing, to allow reading and reference in environments potentially destructive to paper documentation (e.g. bath and shower, rain, etc.). Possible additional functionality the device could provide is dynamic graphics (i.e. the capability of animated, moving pictures or illustrations to enhance reading and more effectively illustrate reference material).

**SUBSTITUTE SHEET**

- 13 -

What I claim as my invention is:

1. A portable, electronic reading and reference device comprising:
  - a functionality which excludes programming capabilities, and which does not allow the device itself to be programmed;
  - a monochrome or colour visual display of pre-defined groups of text, data and/or graphical characters;
  - a media drive mechanism to access pre-defined groups of text, data and/or graphical characters from a pre-encoded unit of data storage media which has been inserted into the drive;
  - an integrated circuit assembly incorporating the required microchips and integrated software;
  - control mechanisms which manage the functionality;
  - a capability of operation using standard electrical delivery or a rechargeable batteries system; and,
  - a combination cover, support stand and carrying handle.
2. A portable electronic reading and reference device as defined in claim 1, with the capability to sequentially access and display groups of text, data and/or graphical characters by the next or previous group.
3. A portable electronic reading and reference device as defined in claim 1, with the capability to access and display a specific group of text, data and/or graphical characters by activating a "locate" control and inputting the unique identifier of the required group via a numerical keypad.

**SUBSTITUTE SHEET**

- 14 -

4. A portable electronic reading and reference device as defined in claim 1, with the capability to access and display the specific group of text, data and/or graphical characters which was the most recent displayed from a unit of data storage media by activating a "last group displayed" control, unless the last group displayed is one which has been defined as not to be accessed and displayed when this function is used, in which case the most recent group displayed which does allow this functionality will be displayed.
5. A portable electronic reading and reference device as defined in claim 1, with the capability for modification of the size of the text, data and/or graphical characters displayed.
6. A portable electronic reading and reference device as defined in claim 1, with functionality which provides automatic power shut off if the device controls have not been activated within a specified time period.
7. A portable electronic reading and reference device as defined in claim 1, with control functions to allow the modification of one or more of the display attributes of resolution, definition, contrast, brightness, colour and tint of the background and/or the text, data and/or graphical characters displayed.
8. A portable electronic reading and reference device as defined in claim 1, with user activated control mechanisms to manage the functions of:
  - manual power on and off;
  - display visibility adjustment;
  - text, data and/or graphical character size adjustment;

**SUBSTITUTE SHEET.**

- 15 -

next or previous sequential display of groups of text, data and/or graphical characters;

access of a specified group of text, data and/or graphical characters;

access of the most recent group of text, data and/or graphical characters displayed from a unit of data storage media.

9. A combination protective cover, support stand and carrying handle mechanism for use with the portable electronic reading and reference device as defined in claim 1.

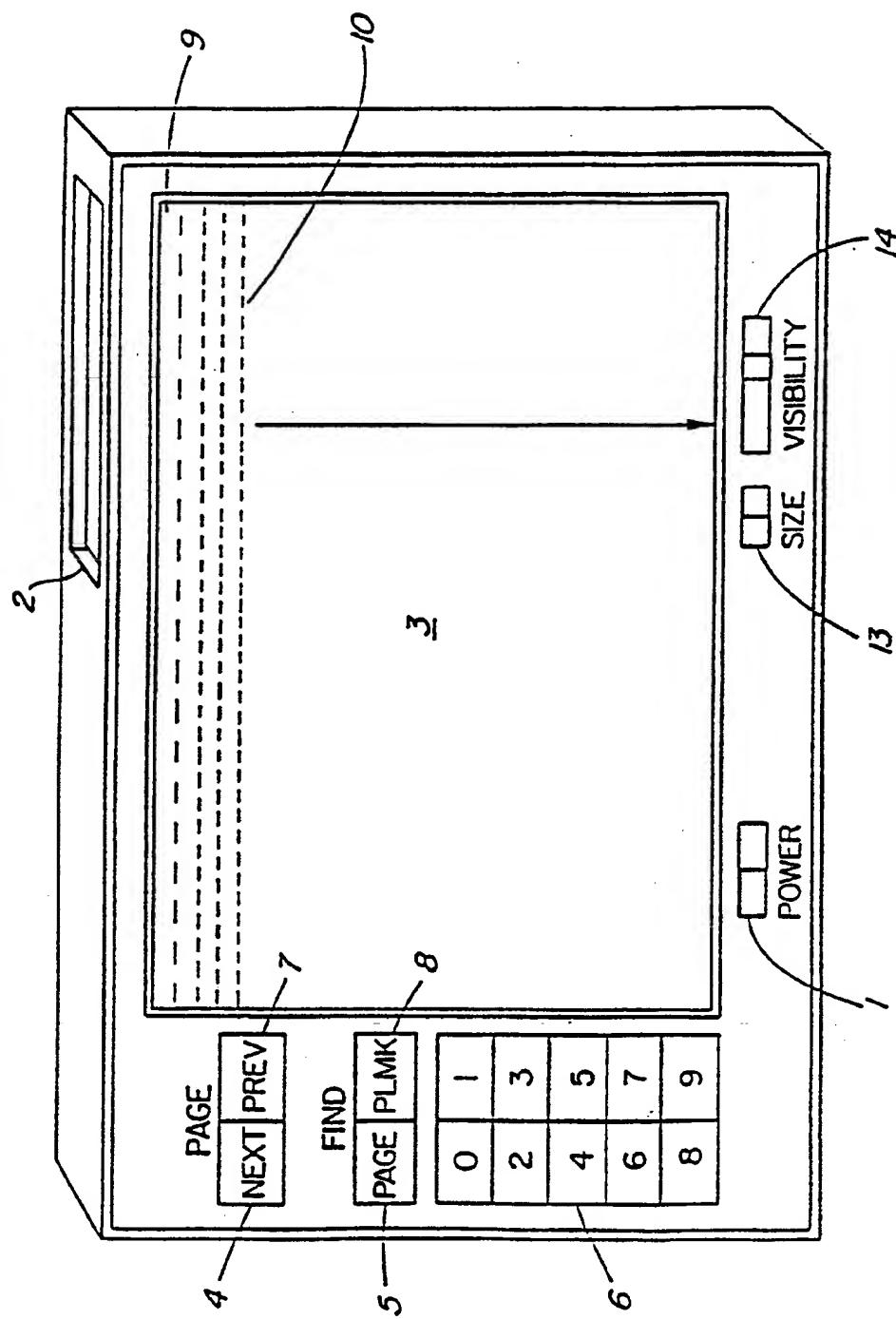
10. A combination protective cover, support stand and carrying handle mechanism as defined in claim 9, which, when in the closed position, fully encloses and protects the front and top of the device, and presents an attached carrying handle.

11. A combination protective cover, support stand and carrying handle mechanism as defined in claim 9, which, when in the open position, can provide the function of an adjustable free-standing support for the device.

12. A combination protective cover, support stand and carrying handle mechanism as defined in claim 9, which, when fully opened, allows the device to rest on a surface with a minimal angle of elevation from parallel with the surface.

**SUBSTITUTE SHEET**

1/4

**SUBSTITUTE SHEET**

2/4

PAGE NNNN (AREA FOR TITLE, AUTHOR, ETC.) FIND (NO) PAGE NNNN  
THIS TEXT ILLUSTRATES THE DIFFERENCE BETWEEN THE NORMAL (FIGURE A) AND  
ENLARGED (FIGURE B) CHARACTER DISPLAY MODES, AS IN THE SPECIFICATION.

FIG. 2A

PAGE NNNN FIND (NO) PAGE NNNN  
THIS TEXT ILLUSTRATES THE DIFFERENCE  
BETWEEN THE NORMAL (FIGURE A) AND  
ENLARGED (FIGURE B) CHARACTER DISPLAY

FIG. 2B

SUBSTITUTE SHEET

3/4

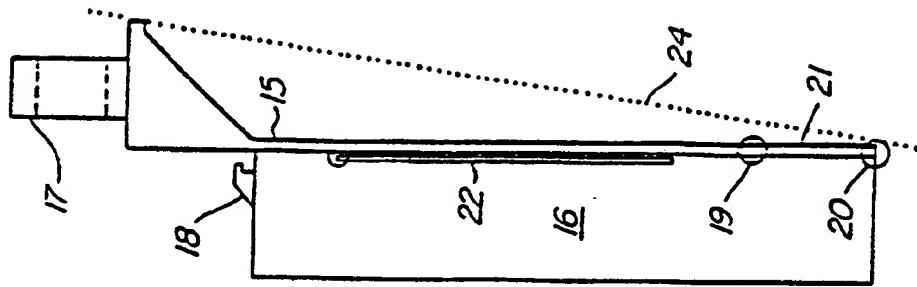


FIG. 3C

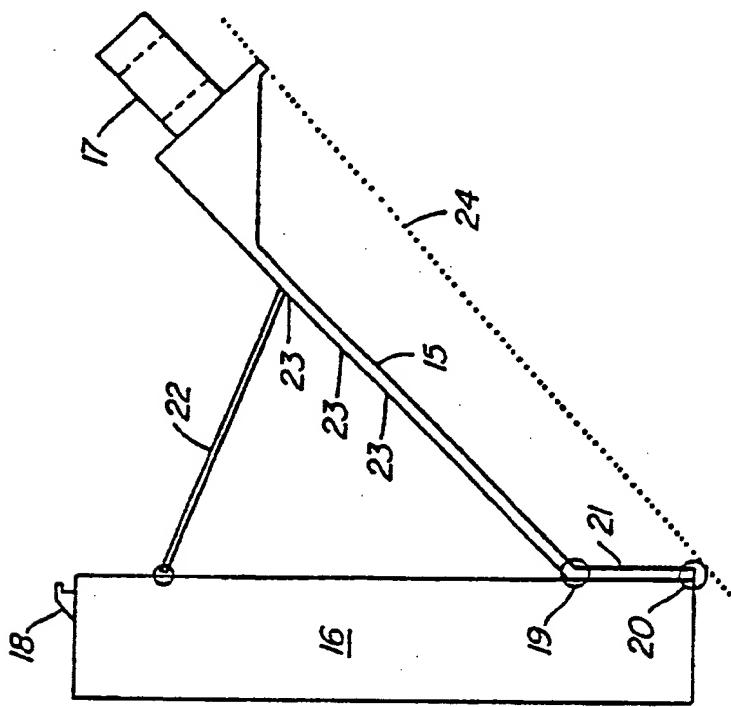


FIG. 3B

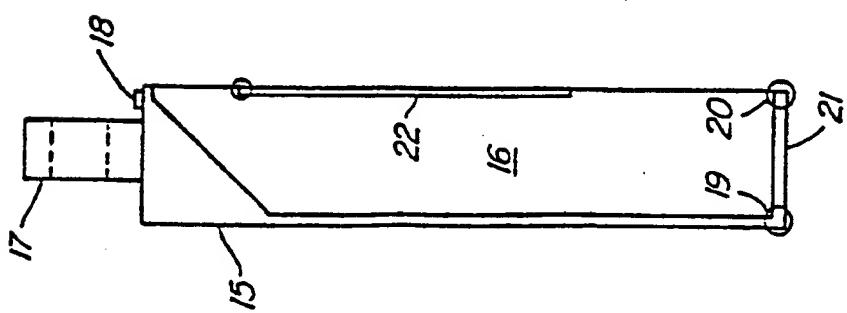
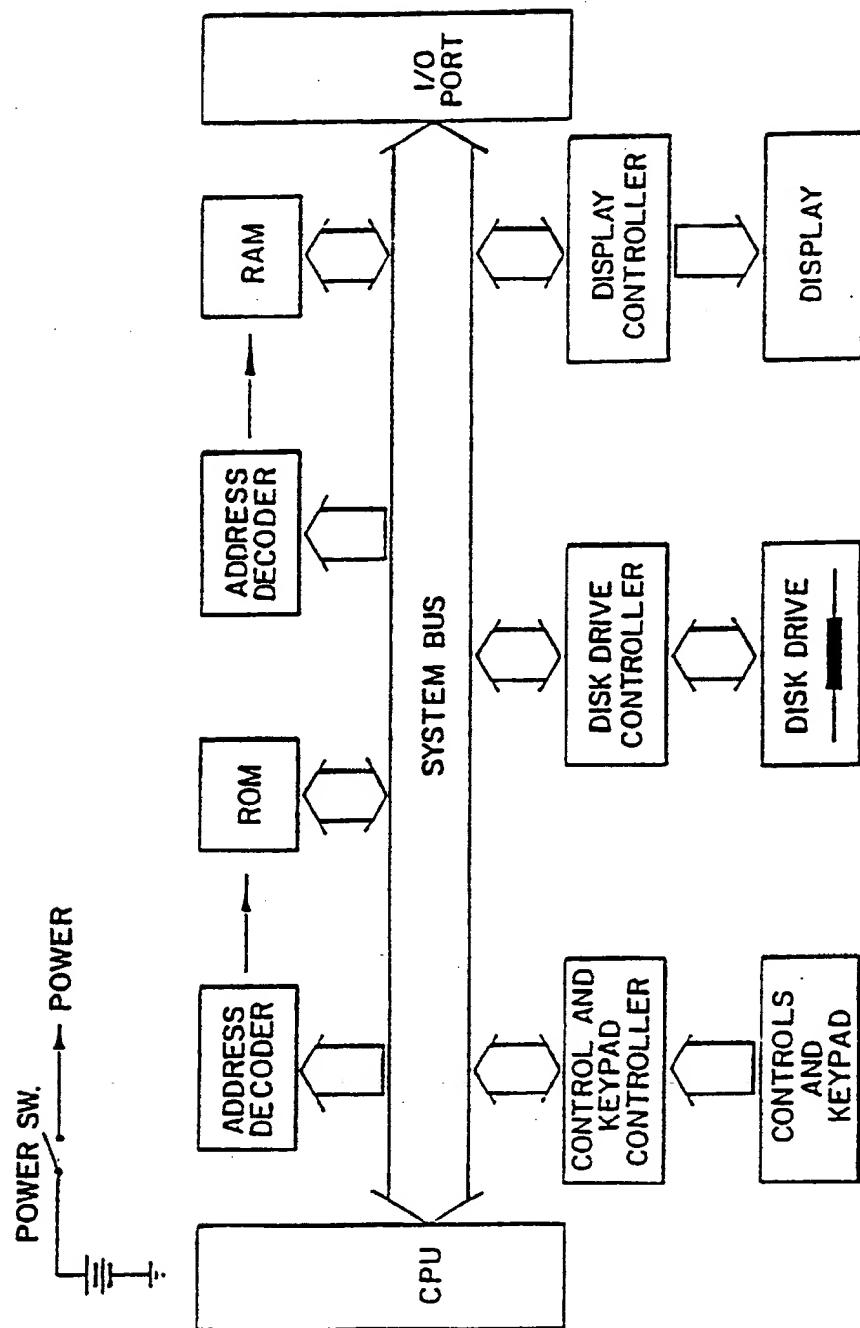


FIG. 3A

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4/4

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# INTERNATIONAL SEARCH REPORT

International Application No PCT/CA 91/00018

## I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) \*

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC<sup>5</sup>: G 06 F 15/02

## II. FIELDS SEARCHED

Minimum Documentation Searched ?

Classification System	Classification Symbols
IPC <sup>5</sup>	G 06 F
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *	

## III. DOCUMENTS CONSIDERED TO BE RELEVANT \*

Category *	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
Y	EP, A, 0337401 (BERTELSMANN) 18 October 1989 see column 2, line 55 - column 3, line 49; column 5, lines 8-47; column 6, lines 32-40; column 9, lines 42-48; column 11, lines 5-12; figure 1; figure 2; figure 3B --	1-5, 7-9
Y	EP, A, 0254889 (TOSHIBA) 3 February 1988 see column 1, line 50 - column 2, line 9; figure 2; figure 7	1-9
A	--	10-12
Y	GB, A, 2183886 (BOTTRIELL) 10 June 1987 see page 1, lines 70-80; page 2, lines 34-110; figures 2,5,6,7 --	1-9 --

\* Special categories of cited documents: <sup>10</sup>

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"Z" document member of the same patent family

## IV. CERTIFICATION

Date of the Actual Completion of the International Search

21st March 1991

Date of Mailing of this International Search Report

19.04.91

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

miss T. MORTENSEN

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, ** with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	US, A, 4259568 (DYNESSEN) 31 March 1981 see abstract; figure 1 -----	1,9-12

ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.

CA 9100018  
SA 43600

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 12/04/91. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A- 0337401	18-10-89	None		
EP-A- 0254889	03-02-88	US-A-	4951241	21-08-90
GB-A- 2183886	10-06-87	None		
US-A- 4259568	31-03-81	None		